Computational Modeling in Support of High Altitude Testing Facilities, Phase II

Completed Technology Project (2008 - 2010)

Project Introduction

Simulation technology plays an important role in propulsion test facility design and development by assessing risks, identifying failure modes and predicting anomalous behavior of critical systems. This is true for facilities such as the proposed A-3 that will operate at low pressures in conjunction with steam ejectors and the B-2 facility where flame deflector cooling and plume impingement dynamics become important. Integrated analyses of facility designs that include supersonic diffusers, steam ejectors, valves, cooling spray nozzles and turning ducts will be carried out for both steady state operation and shutdown/startup transients. More importantly, predictions related to thermal and pressure loads on diffuser/deflector walls will be made and transient phenomena such as blow-back during shutdown and start-up blast waves will be studied. The proposed innovation expands on the multi-element unstructured CFD which has been validated for complex valve/feed systems and high pressure propellant delivery systems used in engine and component test stands at NASA SSC. The focus here will be on extending this capability to include advanced models for analysis of non-equilibrium two-phase flow dynamics and heat transfer in water injection systems in the flame deflector, steam loaded plume entrainment, chemical steam generator performance and operation of steam ejectors.

Primary U.S. Work Locations and Key Partners

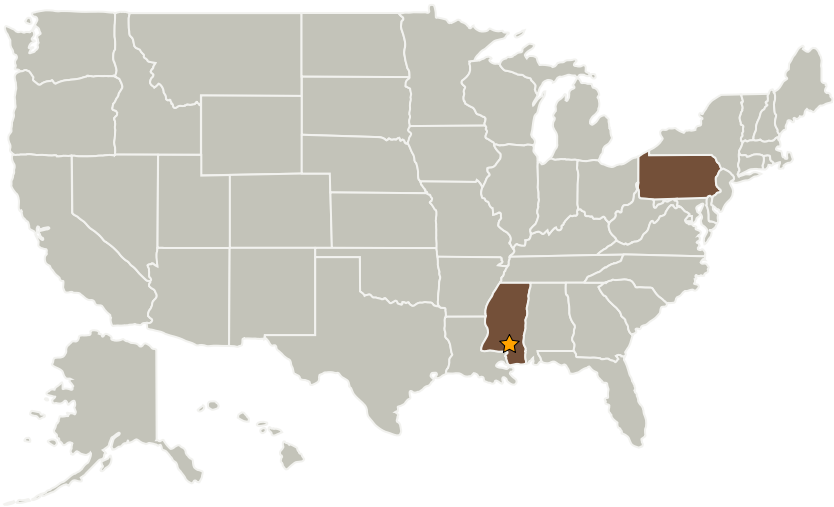

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
CRAFT Tech - Combustion Research and Flow Technology	Supporting Organization	Industry	Pipersville, Pennsylvania

Primary U.S. Work Locations	
Mississippi	Pennsylvania

Project Transitions

February 2008: Project Start

August 2010: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.1 Infrastructure Optimization
    - TX13.1.6 Test, Operations, and Systems Safety